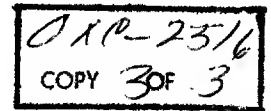


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Progress Report

Period of 8/15/61 to 9/15/61

Contract No. AF33(600)40280



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**60-6487 61**

General

Major activities for the monthly reporting period were in the fabrication, shop follow and testing of the various units and subassemblies. Three technical conferences were held to investigate basic system features.

Approximately 90% of the fabrication drawings have been released to the Model Shop and indications are that essentially 100% completion will be achieved during the next reporting period.

The chart on page 2 shows in graphical form the overall program status.

Page 3 shows a graph of drawing releases to the Model Shop.

DOWNGRADED AT 12 YEAR INTER-  
VALS NOT AUTOMATICALLY  
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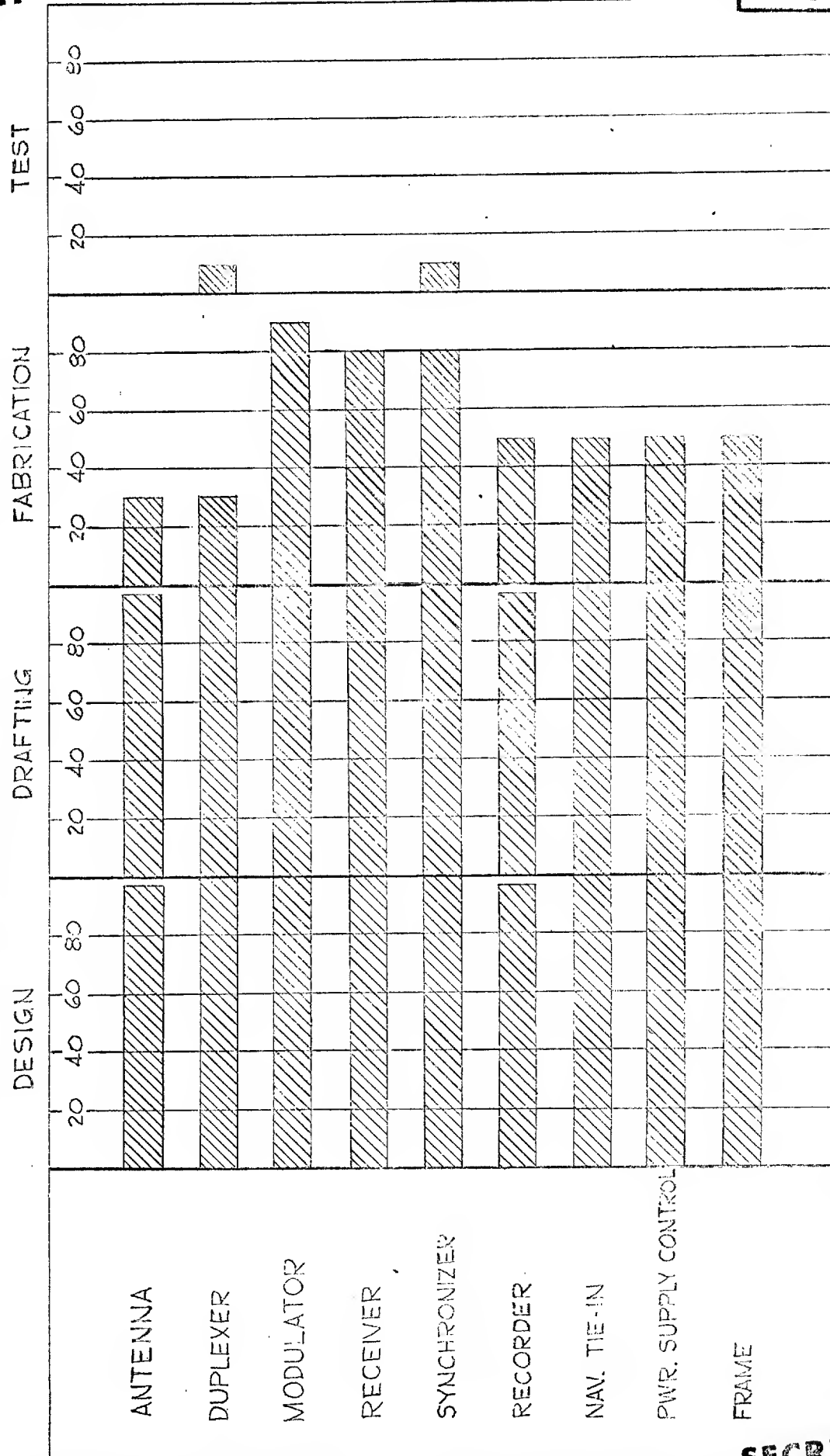
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# PROJECT STATUS

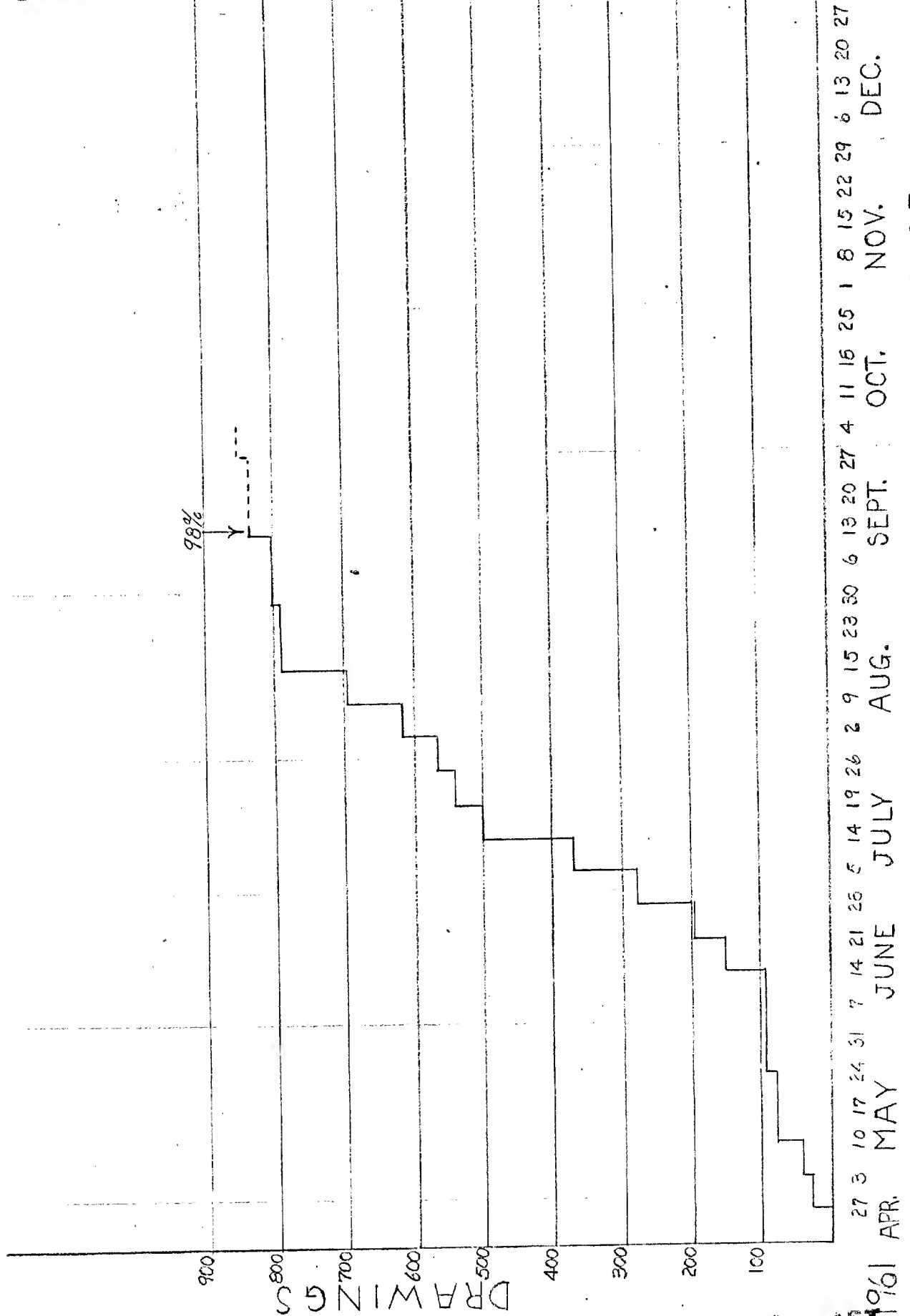
% COMPLETION OF 1ST RADAR FOR PERIOD ENDING 15 SEPT. 1961



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DRAWINGS RELEASED TO MODEL SHOP

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010-2516  
COPY 3 OF 3Auxiliary Data Recorder

Customer approval was received for the addition of an Auxiliary Data Recorder to the radar. Three units have been ordered.

Flight Test

The Flight Test Proposal was approved and the flight test program was begun. Drawings of the radome installation are under way.

System

Three technical conferences were held. The first was with

25X1 [redacted] for the purpose of making a comparison of parameters between the AN/APQ-93 and the system demonstrated by the [redacted]. There appeared to be a considerable discrepancy in signal-to-noise ratio to the disadvantage of the AN/APQ-93. Later investigation into the [redacted] revealed some incorrect assumptions about antenna gain and equivalent target size. 25X1 When corrected, the two systems come out to be nearly equivalent.

At the second meeting at SEI a simplified mathematical model of the AN/APQ-93 system was discussed.

At the third meeting with [redacted] and ITEK, criteria for determining film velocity and offset frequency were developed, also a theoretical relation between spot size and film resolution. 25X1

The problem of pitch stabilization was proposed to be compensated by a swept local oscillator, however it was later determined that such compensation while correcting for frequency spread, produces phase errors which destroy the coherent integration of the system. Other means of compensation are under investigation.

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0-1#1  
OK-2576  
COPY 3 OF 3AntennaStructure Analysis

The honeycomb beam for the Flight Test Program will be replaced by a solid magnesium plate. Relaxed weight requirements made this possible while the long lead procurement time for regular honeycomb beam made this advisable.

Radome Laminate Design

Alternate methods of sealing the slotted array sticks are under consideration. They include using ML laminate with a silicone rubber adhesive backed up by a special clamp, and coating the sticks with ML varnish which is alternately applied and dried until .005" layer is built up. All the methods are currently under pressure and temperature test.

Load Design

The supplier has successfully completed modified samples and is currently shipping in quantity.

Outside Radome

Sample "A" sandwich and thin panel samples were received and tested. Results indicate that "A" sandwich construction will be acceptable. A "B" sandwich panel is scheduled to be shipped 15 Sept. 1961.

Fabrication

The supplier of electro-formed manifolds and waveguide sticks has encountered difficulties which are delaying shipment. The problems are being solved and delivery is promised to start 18 Sept. 1961 for the array sticks and 22 Sept. 1961 for the manifold.

Two honeycomb stainless beams were shipped by the supplier on August 30 and September 1 but have not yet arrived. Tracers are being instituted. Power dividers slipped in schedule from 18 Sept. 1961 to 1 Oct. 1961 because of supplier procurement difficulties.

#### Duplexer

Recent Westinghouse tests indicate the following:

1. The resonant ring, ordered by SEI, suffers from lack of directivity in individual 3 db couplers, leading to excessive back wave. Changes have been made in the Westinghouse PDS Spec to insure better directivity in these couplers.
2. Switches as supplied by RM&G, operating at 2 atmospheres of nitrogen are not satisfactory for the final units.

Initial tests at Airtron on the silver-laminated invar guide indicate this material will be quite satisfactory for final production units. Airtron has shipped a 4' section of dual square-cross section silver-laminated invar waveguide to Westinghouse and tests on this section will be conducted.

Drawings for the duplexer and associated waveguide were released during the week of 14 August 1961. Fabrication is proceeding satisfactorily.

#### Duplexer Driver

The first subassemblies are being completed and tested.

Checks were made on MHV connectors and RG-59/U cable which will be used to pulse the dump switches. Tests at  $< 5$  psia and  $71^{\circ}\text{C}$  showed these connectors to be satisfactory.

OFA-2516  
COPY 3 OF 3Power Monitor

Fabrication is proceeding satisfactorily.

Switch Tubes

During this period work continued on development of a switch which depended on low pressure phenomena for power hold-off and triggering characteristics. As outlined in the previous report, the work of this period was concerned with eliminating the capillary tubing. This was necessary because of the excessive heating of the tubing by the incident RF power.

To make up for the loss of diffusion of electrons which could be expected using the capillary tubing, larger diameter electrodes with small gaps were investigated in resonant structures. The results of these experiments were negative. The resulting resonant structure had a high Q and was very lossy. Another difficulty encountered with this tube was the failure of the discharge to take place in the gap at the pressures needed to hold off the full line power. The discharge occurred over the longer path between waveguide walls rather than the shorter path in the gap.

Recently some experiments have been run at the higher end of the pressure range and the results have been more encouraging. Ability to hold off full power and to control breakdown has been demonstrated. Because it was necessary to put a two terminal pair tube in the ring line without a short behind the tube in order to obtain a peak power better than 250 Kw, breakdown time was not measured. Modifications will now be made to the ring in order to measure this parameter.

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Because of the short time schedule remaining, it is expected that development of a high pressure device will continue. The problems associated with it may be easier to overcome than those associated with the low pressure device. An attempt will be made to construct a tube for use in the Airtron ring circuit before October 1. This will be done concurrently with the development work.

#### Modulator

Design modifications to the pulse transformer by the supplier in an effort to obtain a higher breakdown voltage resulted in failure.

Investigation revealed that continued failures were due to overheating and a new transformer was designed and tested. No failure occurred in the new unit after several hours of continuous operation.

Due to the larger case size of this transformer, it will be necessary to relocate some of the modulator parts.

Wiring of the first modulator has been completed and the casting is now being machined.

#### Receiver

##### TWT

The TWT mounting bracket assembly has been built and is ready for wiring. The first TWT was delivered to the shop by Engineering. Delivery of three TWT's is scheduled for October, November and December as reported last month.

##### I.F. Amplifier

These units are approximately 80% complete in wiring. The interstage transformers and one or two other components have not yet been received.

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### Video Amplifier

Wiring of these units is approximately 70% complete and fixed coils have been received and installed. One or two items have yet to be received.

### Synchronizer

#### Frequency Generator

Wiring of three sub-chassis for the first system is now in progress.

The present oscillator-discriminator unit has a defective oscillator section. A new replacement unit is now due from Bulova.

Present effort is directed toward evolving a satisfactory lock-up method which will cause the variable-frequency-section oscillator to be automatically tuned to the proper frequency to lock up with the fixed-frequency section.

#### Synchronizer Generator

This is now in the process of being bench tested.

#### Synchronizer Chassis

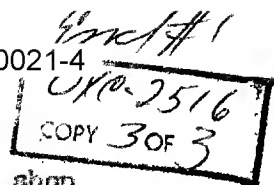
One system has been completely wired and all change orders covering installation of cable clamps etc. have been written.

#### Stalo and Receiver

Laboratory checks on the modified phase detector-amplifier resulted in the following:

1. Some changes in components were made in the initial 30 mc amplifier stage to obtain the desired gain.
2. A few components were mechanically rearranged.
3. Several resistor values in the DC amplifier were changed to improve the gain, minimize residual hum and improve the operating point adjustment range.

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The above two stato assemblies have been returned to the shop for assembly in the receiver which will soon be ready for testing.

### Recorder

#### General

Assembly of the electronic package is complete in most details, and testing has been started. Mechanical assembly is continuing with some problems developing in connection with film tracking. Photographic tests to obtain resolution data on the fibre optic cathode ray tube were started.

#### Electronic

The electronic package for unit no. 1 is complete except for the data flash capacitors. All the circuitry in the package has been checked in a preliminary manner and found to be operative. Minor engineering changes were made in the chassis; one of these was the change of centering circuit resistors to 1.8K ohm 2 watt values and a respacing of these resistors for better heat dissipation. Higher speed transistors may have to be used in the input flip-flop in order to reliably trigger on the 40 nanosecond input pulses. Sylvania and CBS high speed transistors are being investigated for this application.

The test rack has been checked in a preliminary manner and found to be operating properly. Purchase orders for a few rack mounted items to complete this test rack have been initiated. Cabling external to the package has been designed and is being fabricated. Nearly all electronic parts for units no. 2 and no. 3 including long lead items such as yokes, relays, etc. are on hand.

#### Optics

A severe setback occurred when an unfolding fibre optic array cracked during the potting operation. Another fibre optic array is being awaited. This area is causing difficulty in scheduling.

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### Mechanical

Work has continued on testing of the mechanical portion of the recorder with emphasis on improving film motion and film tracking.

Some of the tracking difficulties were overcome by adopting a new film threading path for the film loop take-up drive which allows the film to be wound on the take-up reel smoothly. No difficulties are being experienced with the supply side of the film path since the two separate contact rollers were changed to one continuous roller as previously reported.

A closer look at the eccentricity requirements of the pulleys, bearings and drive rollers caused a redesign of the pulley assemblies to 20 micro-inch concentricities and the use of 20 micro-inch bearings at the critical film drive stations. The recorder will be modified to accept these new parts next month on their arrival.

The data input assembly was completed and some photographic testing done. Some uneven illumination of the watch and data card was noted but it has not been decided whether improvement is necessary.

The cathode ray tube, shield and yoke have been assembled and are presently in testing.

### Photographic

Several photographic tests have been made with the 1 mil spot size CRT (Westinghouse WX4745). With a 4 kc triangular sweep in the X direction and suitable blanking, the "line" is swept linearly in the Y direction at a rate of about one inch per second to simulate the linear film motion past the fibre optics. First photos showed a severe 60 cycle pattern on the

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film which was eliminated by reorienting the CRT position. We have now affixed the magnetic shield on the CRT and are proceeding with the photo-tests.

#### Navigation Tie-In

An accelerometer built by the Model Shop is now being tested.

The servo amplifiers and the gain-adjust assembly are nearing completion.

The ground speed and drift angle motor assemblies have been received and are being checked.

Delivery of the pitch angle motor assemblies has been scheduled for the last week in September.

A synchro torque transmitter has finally been received and laboratory tests of the breadboard pitch angle servo repeater can now be completed. This synchro will also be used in unit testing of navigation tie-in.

It is anticipated that the navigation tie-in may be available for unit test on 1 October 1961.

#### Power Supply and Control

All drawings have been released and assembly of the power supply is progressing satisfactorily.

Some delay has been encountered in assembling the control panel due to the necessity of returning a switch to the supplier. Return of the switch to Westinghouse is scheduled for 20 September 1961 at which time it is expected that assembly of the control panel will be resumed.

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Frame (Electrical)

The final wiring tabulation is now being checked and will be released on or before 22 September 1961.

All long lead purchase parts for the frame cabling have been ordered and 90% of the items have been received.

Drawings for the frame junction box are now being checked and will be released by 20 September 1961.

Frame (Mechanical)

All drawings have been released to Manufacturing.

Numerous detail parts and some subassemblies have been fabricated.

It is expected that assembly of the frame itself will start during the next reporting period.

Truss

Preliminary design is complete and drafting will start during the next reporting period.

Stress Analysis

The load and stress analysis has begun and will be completed prior to the start of drafting on the truss drawings.

Unit Test Cables

Final drawings have been released.

All long lead purchase parts have been ordered and 90% of the items have been received.

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